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of their real significance and must lead to fruitless results," is to decry all investigation; for that is just what every physiologist in the twentieth century is doing. That "physical attributes . . . . can never explain qualities like nutrition" is a bold prophecy and a most discouraging one, though we be yet far from that goal. "Strictly physical and chemical processes" are contrasted with "strictly vital" ones, in that with the latter it "becomes impossible to predict what effect a particular cause will produce." True; but only because we do not know enough. NOLL disclaims "vital force" in terms, but constantly writes as though it were a necessary assumption.

The second part, entitled "Special botany," is doubtless the part of the book that gives it its deserved rank among texts. It is really and dominantly modern morphology as to facts, but not in spirit. It is a well-selected thesaurus of morphological information, in using which one feels a certain measure of confidence, and this is what has made the book indispensable. But the controlling spirit of morphology is lacking, because there is no conception of continuity in the plant kingdom. To an American teacher of botany this means that the facts are dumped down in piles, with no attempt to use them in the organization of a structure. It is good science, but poor teaching; and that seems to be the general method of instruction in German universities. This is not intended as a criticism, but merely as the statement of a distinction.

"Special botany" comprises "Crytogams" and "Phanerogamia." Note the incongruous forms of the two names, and the perpetuation of the old notion that a great chasm is fixed between cryptogams and seed-plants. Through the cryptogams and gymnosperms and the introductory part of angiosperms one breathes, for the most part, the atmosphere of modern morphology; but after that there are 170 pages dealing with the details of the classification of "Monocotylae" and "Dicotylae." And here comes a demand on the German student that fills the American teacher with amazement. It simply means that students in medicine and pharmacy are driven into these courses in botany; that it is supposed to be good for them to digest this encyclopedic information about groups of plants; that the German professor of botany cannot dispense with the fees of these students; and that all German textbooks on botany must contain this dreary waste of pages. We would suggest that this German educational necessity should not appear in the English translations, for it needlessly enlarges the book for American use.—J. M. C. and C. R. B.

Plant anatomy

Under this title STEVENS has written a book[2] which deals with the development and functions of plant tissues. Structure and function are so intermixed, and rightly, that there is no anatomical part of the book as distinct from the physiological. In a review, however, the description of structures and of their functions may be mentioned separately.

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[2] STEVENS, WILLIAM CHASE, Plant anatomy, from the standpoint of the development and functions of the tissues, and handbook of micro-technic. pp. xii+348. *figs. 136*. Philadelphia: P. Blakiston's Son & Co. 1907. $2.

In the days of the SACH's régime, introduced into this country by BESSEY, the detailed study of tissues was a prominent feature of botanical instruction. It was gradually eliminated because of the growing demand for details that were thought to be significant in the evolutionary history of plants. A fact without a suggestive and large meaning came to be regarded as not worth while in elementary teaching. Doubtless this elimination of the study of tissues as such went too far, and a generation of botanists has been developed with too little knowledge of this kind. Then came the wonderful modern revival of anatomy so far as the vascular system is concerned, but this revival had to do with the evolution of vascular plants. STEVENS has carried us back again into the old atmosphere of tissues, but he has sought to avoid the old deadness of the subject by relating tissues to their functions. The spirit that animates the "skeleton," therefore, is physiological and ecological, and not the conception of evolution. The tissues are well described and illustrated, for STEVENS is an excellent teacher; and the text and drawings have been prepared in large measure directly from material under observation. It is to be regretted, however, that no trace of the modern vascular anatomy appears. For example, the remarkable development of knowledge in reference to the relation between the vascular anatomy of monocotyledons and dicotyledons would seem to have deserved mention. It may be claimed that relationship is not being considered, but this particular relationship has to do with previous misconceptions as to the actual structure of the vascular anatomy of monocotyledons.

Remembering that this is a book on physiological anatomy and not a textbook of plant physiology, we may properly commend the presentation of such topics as come within its scope. That is far less comprehensive than the well-known work of HABERLANDT, and the matter is far more elementary. The topics presented are chiefly those of entry and exit of materials, their movement in the plant body, and the processes of nutrition in the broadest sense. These are presented simply, clearly, and in the main accurately. Clever diagrams have been freely used, and they fulfil well the author's design of rendering more real the processes described. If they have any fault it is perhaps in tending to make conceptions too formal. Growth movement and the extensive phenomena of irritability do not come within the author's plan.

One unfortunate conception, embodied in chapter headings, and wrought into the text, is that of "circulation" of water and foods in "circulatory tissues." This idea dies hard, and we are sorry it has a new lease of life in this book.

The final chapters deal with the preparation of sections, use of the microscope, reagents and processes, the michrochemistry of plant products (not always reliable), and the detection of adulterations (too short to be really useful).—J. M. C. and C. R. B.